6 ACCIDENTAL RELEASE OF RADIOLOGICAL MATERIAL

This analysis examines changes in potential impacts from accidental release of radiological material associated with proposed or newly funded projects and programs and from the evolution of safety models and guidance documents for conducting safety analyses since 1992. In accordance with the 1992 EIS/EIR (DOE 1992), a deterministic (i.e., nonprobabilistic) approach was used to develop accident scenarios, including those scenarios without a specific initiating cause. The analysis is specific to three buildings or building complexes that have administrative controls on sensitive radiological material (uranium, plutonium, and tritium) used at LLNL. Impacts from these changes are evaluated and compared with the impacts assessed in the 1992 EIS/EIR. The evaluation examines the potential radiological accident impacts under the current and newly proposed administrative limits and accounts for change in safety basis guidance important to the bounding criticality accident in Building 332. The evaluation relied on review of safety basis documentation, safety analysis reports (SARs), program manager descriptions of the reasons for needing higher administrative limits, and the results from some additional consequence modeling.

Administrative limits are criteria that establish the maximum quantities of radioactive materials that may be present in a building or group of buildings at LLNL. These limits are established primarily on the basis of program needs and available space. As the name implies, the limits are administrative in nature rather than regulatory. The limits may or may not directly tie to safety analysis results for specific accident scenarios. In some cases, administrative limits are set as a

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- 1992 EIS/EIR: The bounding accident for Building 332 was determined to be a plutonium criticality event. This accident was estimated to have a probability of occurrence of less than 1×10^{-6} per year. The maximally exposed individual (MEI) dose for this event was evaluated to be 2.0 rem.
- 1992-1997: A safety analysis report (SAR) was issued in 1995 (amended in 1997) for Building 332. A detailed analysis in the 1995 Building 332 SAR indicated that an inadvertent criticality accident in Building 332 is credible; i.e., the probability of occurrence is greater than 10^{-6} per year. The SAR identified a uranium criticality accident in that building as the bounding accident for the facility. That safety review was conducted in accordance with revised safety basis documentation (DOE Orders and guidance) not available during the preparation of the 1992 EIS/EIR.
- 1998-2002: The Building 332 criticality accident consequences presented in the 1992 EIS/EIR were examined in light of changes proposed in the administrative limits for uranium and plutonium and the change in the facility bounding accident identified in the 1995 SAR for Building 332. As identified in the 1995 SAR, if a uranium criticality event occurred in Building 332, the MEI dose would double from that estimated for the plutonium criticality event in the 1992 EIS/EIR. There may also be a small, incremental increase in frequencies of operations because of the proposed increase in the uranium administrative limit. Changes in the administrative limits for other buildings would result in no change or very small change in potential consequences. Although the calculated consequences for Building 332 have increased since publication of the 1992 EIS/EIR, the impacts are still within the bounds of the greatest radiological accident consequences for the entire LLNL site evaluated in the 1992 EIS/EIR.

  An updated SAR and a new Technical Safety Requirement (TSR) document were approved in late 1998 for Building 331. Both support the continued applicability of the 1992 EIS/EIR accident scenario for the facility. The TSR limits tritium consolidation to the 3.5 g used in the accident scenario, and the SAR reaffirmed the adequacy of the bounding accident building amount so that classified information regarding exact quantities of materials is not revealed. The administrative limits specified for the Building 332/334 complex and Buildings 239 and 331 in the 1992 EIS/EIR need to be increased as a result of proposed projects and plans. These increases will allow LLNL to operate more efficiently and better meet the needs of DOE over the next 5 years.

The potential health and safety impacts from radiological accidents analyzed in the 1992 EIS/EIR are summarized in Section 6.1. The impacts from proposed or newly funded programs and projects projected during the period 1998-2002 and affecting administrative limits in the above buildings are summarized in Section 6.2. This analysis includes review of the radiological accidents addressed in the 1992 EIS/EIR, safety basis documentation and guidance, and current SARs. Conclusions are presented in Section 6.3.

6.1 THE 1992 EIS/EIR ASSESSMENT

The current administrative limits, in effect prior to 1992, for LLNL buildings with proposed limit changes are listed in Table 6.1 (DOE 1992). These limits, which cover the operation of Building 331 (Tritium Facility), Building 332 (Plutonium Facility), Building 334, and Building 239 (Nondestructive Test Facility), were established under then-current and projected defense programmatic and project needs for the period 1992 through 2002. Administrative limits for other facilities that are not proposing changes can be found in the 1992 EIS/EIR.

TABLE 6.1 1992 EIS/EIR Administrative Limits on Radioactive Materials for Buildings 332, 334, 331, and 239 at the Livermore Site

Building	Existing Limit[a] (1992 EIS/EIR)
Plutonium Facility[b]: Bldg. 332 and Bldg. 334	
Uranium	300 kg
Plutonium	200 kg
Tritium Facility[b]: Bldg. 331	
Tritium	5 g
Nondestructive Test Facility: Bldg. 239	
Plutonium	4.5 kg
Uranium-235	18.5 kg

[a] Limits in effect with the 1992 EIS/EIR ROD.

[b] Buildings 331, 332, and 334 are collectively referred to as the "Superblock."

The 1992 EIS/EIR established an accident analysis protocol to assess potential impacts from bounding accidents at radiological or nuclear facilities at LLNL and SNL. A screening process was used that reduced the number of buildings considered for accident scenarios from an initial 653 to 8. This screening process included exclusion of administrative buildings, buildings ranked as low hazard, and buildings without radioactive materials. Additional screening criteria included eliminating all buildings with radioactive materials only in a solid, sealed source and consideration of radioactive material type, quantity, physical form, confinement, use, and storage. The screening process identified nine accident scenarios involving radioactive material in eight buildings, seven of which were at the Livermore site. The Livermore site facilities included Buildings 251, 331, and 332/334, which contain uranium, tritium, and transuranics (TRU) including plutonium; the Building 490 complex; and Buildings 298, 612, and 625. The eighth building assessed was Building 968 at SNL, Livermore. The screening process eliminated Building 334 (a hardened engineering test building containing sealed sources) of the Superblock from further bounding accident assessment consideration since its accident impacts were bounded by those of other buildings.

The 1992 EIS/EIR identified and assessed “reasonably foreseeable” accident scenarios for each of the eight buildings selected in the screening. Accidents can be ranked on the basis of the magnitude of the effective dose equivalent to a hypothetical member of the public (maximally exposed individual, MEI) at the closest site boundary, as was done in the 1992 EIS/EIR, or on the basis of total population dose to the surrounding community, usually out to 80 km distance. More recently, DOE has been quantifying the accident frequencies, striving toward a suite of accidents that characterize the risk to the public from the site operations, and DOE has been quantifying the differences in risk among alternatives. This change in the manner in which accident consequences are presented does not affect or set aside the 1992 EIS/EIR findings as to bounding accidents.

An accident is considered bounding for a particular building, complex, or class of radionuclides if no reasonably foreseeable accident with greater consequence is identified. The highest MEI dose of about 4.2 rem at the 0.3-km site boundary was associated with an americium-241 release from Building 625, which is the bounding radiological accident for the Livermore site. This accident had the highest MEI of the TRU accidents, and an MEI higher than those of accidental releases of tritium (0.2 rem from Building 298 and 0.026 rem from Building 331).

The bounding 4.2-rem MEI dose from the on-site americium-241 release from Building 625 (G12 complex) in the 1992 EIS/EIR is comparable to the 4.4 rem MEI dose at 0.09 km in the recent SAR for the Hazardous Waste Management Facilities (in G12 complex) (LLNL 1998b). The EIS/EIR release was from waste drums impacted by a falling crane during an earthquake; whereas the recent SAR assumes that the contents of one waste drum burn. The MEI dose is sensitive to the assumed location of the burning drum within the complex, but the bounding impact from a TRU release is essentially unchanged from that in the EIS/EIR. When accidents are ranked on the basis of the magnitude of the MEI dose, or on population dose, this waste drum burn scenario is also the bounding radiological accident for the site.

Accident scenarios for the buildings with proposed administrative limit changes in the 1992 EIS/EIR are summarized below for Buildings 331 and 332/334, which have administrative controls on tritium, plutonium, and uranium. Building 239 was eliminated from further analysis with the screening criteria used in the 1992 EIS/EIR. However, an SAR (LLNL 1994c) assessed consequences for the bounding plutonium and uranium accidents for Building 239, and that assessment is discussed below. The impacts from the assessed bounding accident scenarios are discussed and compared in Section 6.2 with impacts that might occur under currently proposed administrative limit changes.

For Building 332, the 1992 EIS/EIR analyzed a hypothetical inadvertent criticality in a glovebox caused by the addition of water to a dispersible quantity of plutonium in an appropriate geometric configuration. The criticality was postulated to yield 10^{18} fissions, with the nuclear reaction terminating as the water evaporated. The energy produced by such a reaction could breach the glovebox, and the resulting fission products could be released into the room. The estimated frequency of occurrence of this event was less than 1×10^{-6} per year. However, despite the extremely low probability of occurrence, the consequences of this accident were analyzed in the 1992 EIS/EIR with the initiator left undefined.

The accident analyzed for Building 332 in the 1992 EIS/EIR involved only a plutonium criticality event, as was required in the regulatory guidance in effect at the time. The 1995 SAR for Building 332 analyzed both uranium and plutonium criticality events because the guidance had been modified to require analyses for both radionuclides. In addition, a detailed analysis in the 1995 Building 332 SAR indicated that an inadvertent criticality accident in Building 332 is credible, i.e., the probability of occurrence is greater than 1×10^{-6} per year.

For Building 331, the 1992 EIS/EIR selected the release of tritium during a large, beyond-design-basis earthquake (peak ground acceleration of 0.8 g) as the bounding scenario. It was assumed that an earthquake occurred while a laboratory technician was opening or transferring the contents of a primary container holding 3.5 g of tritium gas. The tritium gas would be stored in containers with strict quantity limits not to exceed 3.5 g. Administrative restrictions are in place to limit operations to procedures that affect only one primary container at a time.

The SAR for Building 239 postulated an accident that bounds the consequences of radionuclide release for this building. The radioactive material (plutonium or uranium) is brought into the Building 239 basement for radiographic examination. (Radioactive material is not stored at Building 239 but is brought from, and returned to, Building 332 after the test or at the end of each work day.) The radioactive test items are doubly contained. This containment consists, at a minimum, of one hard barrier (metal) and at least one soft barrier (plastic bag). Failure of the containment is unlikely. However, it is conceivable that a seismic event or some other incident involving dropping of the material could result in compromise of the integrity of the containment barriers, thus exposing plutonium or uranium to the building atmosphere and allowing for oxidation of the material and release of some of the oxide. This accident scenario assumes breaching of 4.5 kg of plutonium-239 or 18.5 kg of uranium-235, allowing slow oxidation to the atmosphere for a 48-hour period. The frequency of the design basis earthquake is 2.0×10^{-3}/year (LLNL 1994c).

6.2 ANALYSIS OF PROJECTED CHANGES FROM 1998 TO 2002

The currently proposed changes in administrative limits for the Superblock Buildings and Building 239 are listed in Table 6.2. The project and programmatic bases for these changes and the direct or indirect changes in building-specific bounding accidents are summarized below.

The proposed change in the administrative limit for uranium in Buildings 332/334 is to raise the limit from 300 kg (covering enriched, natural, and depleted uranium) to 3,500 kg (500 kg of >1% enriched uranium and 3,000 kg of <1% enriched uranium). The principal need for the higher uranium limit is to carry out LLNL's role in the Fissile Materials Disposition (FMD) Program. The specific increased need is for uranium dioxide (UO_2) in support of the prototype mixed oxide (MOX) nuclear fuel rod or lead test assemblies for the MOX fuel project. Other major defense-related programs that will be supported under the newly proposed limit are (1) Dual Revalidation, (2) the Advanced Recovery and Extraction System, (3) plutonium conversion, (4) excess special nuclear material (SNM) stabilization and packaging, and (5) uranium conversion to a form for purification and recycle for use in reactor fuel or to a form suitable for safe disposal.

Before 1992, the tritium limit for Building 331 was 300 g. The 1992 EIS/EIR set an administrative limit of 5 g of tritium in any one facility, with no more than 10 g to be divided among Buildings 298, 391, and 331. As currently proposed, the administrative limit for tritium in

TABLE 6.2 Proposed Administrative Limits on Radioactive Materials for Buildings 332, 334, 331, and 239 at the Livermore Site

Building	Proposed Limit[a]
Plutonium Facility: Bldg. 332 and Bldg. 334	
Uranium	500 kg >1% wt. U-235 3,000 kg <1% wt. U-235
Tritium Facility: Bldg. 331	
Tritium	30 g
Nondestructive Test Facility: Bldg. 239	
Plutonium	6 kg
Uranium-235	25 kg

[a] Sources: Fisher (1998); Goluba (1998); Mintz, (1998a-b); Woo (1998).

Buildings 331 would be raised to 30 g. This increase is considered necessary to adequately support major current and projected future programs involving DOE Mound site decommissioning and decontamination (D&D), the expansion of the U.S. Army Tritium Recovery and Recycle Project, and the NIF (target fills).

The administrative inventory limits for Building 239 are proposed to be raised from 4.5 to 6 kg for plutonium and from 18.5 to 25 kg for uranium to accommodate programmatic needs for radiography inspection in Building 239 of sealed containers transported from and stored in Building 332.

6.2.1 Building 332 of the Superblock

6.2.1.1 Background

As mentioned in Section 6.1, the 1992 EIS/EIR identified an inadvertent plutonium criticality scenario for Building 332, with a less than 1×10^{-6} per year probability of occurrence, as a bounding accident for a specific location in accordance with applicable DOE Orders and U.S. Nuclear Regulatory Commission guidance effective in 1992. However, subsequent detailed analyses in the 1995 Building 332 SAR indicated that an inadvertent criticality event (plutonium or uranium) in Building 332 is credible (i.e., the probability of occurrence is greater than 1×10^{-6} per year). To prevent such accidents, a criticality control system based on the double-contingency principle has been developed and implemented for Building 332. Under this system, two independent and unlikely failures or errors must occur before an accident is possible. The proposed changes in administrative limits for plutonium and uranium do not change the 1995 Building 332 SAR conclusion that the inadvertent criticality accident scenario is a credible event, although the probability of occurrence for the event may be impacted slightly by potential increases in frequencies of operations. However, the probability of occurrence could increase significantly, for example, if workers did not follow approved criticality procedures. Should such a situation occur, Building 332 safety personnel would take immediate actions to ensure that unacceptable practices were corrected before the facility would be allowed to return to normal operations (LLNL 1998a). By doing that, the probability of occurrence for the criticality accident scenario cited in the Building 332 SAR remains valid.

Building 332 operations involving uranium or plutonium require the preparation of an Operational Safety Procedure. Although the proposed administrative limits for uranium for Buildings 332/334 would increase the total amount of fissionable materials within Building 332 (from 300 kg uranium to 500 kg of >1% enriched uranium and 3,000 kg of <1% enriched uranium), the procedures would still limit the “material at risk” (MAR) in a glovebox or workstation. It should be noted that the doses or consequences resulting from postulated plutonium or uranium criticality events relate directly to the estimated number of fissions yielded (i.e., 10^{18} fissions) as concluded in the Building 332 SAR. This estimated fission yield is based on historical data and is independent of the Building 332/334 administrative limits for plutonium and uranium. Therefore, the consequences of the plutonium criticality accident analyzed in the 1992 EIS/EIR would remain unchanged.

The Building 332 SAR indicated that the uranium criticality event could result in a higher dose at the fenceline than a plutonium criticality event (predicted dose of 0.34 rem for the uranium criticality event versus 0.25 rem for the plutonium criticality event yielding 10^{18} fissions). The SAR used the modeling code MACCS (Jow et al. 1990), while the 1992 EIS/EIR used the modeling code GENII (Napier et al. 1988) to calculate the estimated doses. For the evaluation reported in this SA, the GENII code was used to perform additional modeling for the uranium criticality event to allow for a direct comparison with the plutonium criticality event analyzed in the 1992 EIS/EIR. While differences in model assumptions, parameters, and formulation between GENII and MACCS probably account for differences in results, the GENII results should be considered conservative (higher doses than MACCS) and yielded a two times higher consequence than the 1992 EIS/EIR results for this accident scenario.

6.2.1.2 Uranium Criticality Analysis

The uranium criticality analysis conducted for this SA used the same assumptions and model (GENII) used for the plutonium analysis performed in the 1992 EIS/EIR. The exposure parameters and modeling assumptions are provided in Appendix D of the 1992 EIS/EIR. An estimated population of 1,417,586 people was assumed to reside west of the site boundary. The western sector was selected for the analysis because it contains the largest number of people. The 70-year total effective dose equivalent (TEDE) was calculated for this assessment. The TEDE is the sum of the effective dose equivalent (EDE) from external pathways and the committed effective dose equivalent (CEDE) from internal pathway. The estimated TEDE and the associated health effects for an off-site individual at the fenceline and for the general population from plutonium and uranium criticality events are presented in Table 6.3.

To confirm consistency in the modeling assumptions between the EIS/EIR and this SA, a plutonium criticality event was modeled, and the results were shown to be consistent with the values reported in the 1992 EIS/EIR. Although the estimated TEDEs for both the off-site individual and the general population are nearly two times greater for a uranium criticality event than for a plutonium criticality event (Table 6.3), the EDE for the uranium criticality event estimated for an individual (approximately 3.6 rem) is still about 100 times less than the dose required to cause fatality from acute radiation exposure (350 to 450 rem). The health impacts (expressed as excess fatal cancer) in Table 6.3 are the impacts that would be expected only if the accident actually occurred. These impacts do not take into account the probability of a postulated accident occurring. The probability of less than 1×10^{-6}/year was used in the 1992 EIS/EIR for a plutonium criticality event.

TABLE 6.3 Impacts from Superblock Plutonium and Uranium Criticality Accidents for the Nearest Off-Site Individual and General Population

	Plutonium Criticality Event		Uranium Criticality Event	
Analysis/Receptor	TEDE[a] (rem or person-rem)	Health Effect[b] (excess fatal cancer)	TEDE[a] (rem or person-rem)	Health Effect[b] (excess fatal cancer)
1992 EIS/EIR Analysis				
400-m Individual[c]	2.0	0.0010	NA[d]	NA
General Population[e]	440[f]	0.22	NA	NA
Supplement Analysis				
400-m Individual[c]	2.0	0.0010	3.8	0.0019
General Population[e]	480[f]	0.24	870	0.44

[a] TEDE = total effective dose equivalent. Units are in rem for individual doses and person-rem for population doses.

[b] Health effect for individuals is the increased chance of developing a fatal cancer over the lifetime of the exposed individual. For population, the health effects are the expected number of latent cancer fatalities among the population.

[c] “400-m Individual” refers to an individual at the site boundary 400 meters from the event.

[d] NA = not analyzed.

[e] Affected population of 1.4 million people in the western sector.

[f] The minor difference in TEDE resulted from a difference in ingestion input parameters.

The TEDE of 3.8 rem at the nearest site boundary falls within the whole-body dose range (1 to 5 rem) at which some protective action is recommended by the EPA. This result is consistent with the conclusion in the 1992 EIS/EIR. The TEDE to the off-site population (870 person-rem) is still estimated to result in less than 1 excess cancer fatality among the 1.4 million people who could be exposed.

6.2.2 Tritium Facility: Building 331

The administrative limit for tritium in Building 331 was 300 g before 1992 but was lowered to 5 g in any single facility, or 10 g total for three particular buildings, in 1992 (DOE 1992). The current proposal is to increase the administrative limit for tritium in Building 331 from

5 to 30 g. The administrative limit for Buildings 298 and 391 is 5 g total between the two facilities. The total quantity of tritium material that would ever be at risk during operations would remain the same as presented in the 1992 EIS/EIR (3.5 g) (Mintz 1998a). The administrative control enforced in 1992 has not changed and still limits the inventory stored in any one vessel or connecting process (the "at risk" inventory) to 3.5 g. Today, this control takes the form of a facility Technical Safety Requirement (TSR) (Mintz 1998a).

The material at risk (MAR) is defined as "the amount of radionuclides (in grams or curies of activity for each radionuclide) available to be acted on by a given physical stress. Different MARs may be assigned for different accidents as it is only necessary to define the material in those discrete physical locations that are exposed to a given stress" (DOE 1994). The MAR for the accident scenario analyzed for the Tritium Facility would be a procedural error involving the release of tritium gas from a container in the secondary containment unit or glovebox.

Accidents with potential for releasing the additional tritium from its stored configuration are not considered credible because of the robustness and passive nature of the storage condition (e.g., sealed, approved shipping containers or thick-walled metal vessels, valved-off, capped, and securely stored) (Mintz 1998a). It is also important to note that major improvements in facility systems and operations since 1992 have significantly reduced the expected frequency of accidents leading to tritium release. Most important has been the imposition of a double containment requirement (gloveboxes) for all high-curie activities and the implementation of more rigorous conduct of operations practices. These improvements have resulted in nearly an order of magnitude decrease in routine emissions (e.g., 2,630 Ci in 1987 vs. 299 Ci in 1997). Accidental releases have also declined dramatically; in fact, there have been none since April 1991. By comparison, 10 "significant" releases (>100 Ci) occurred from Building 331 from December 1986 to April 1991. Most (perhaps all) of these would have been prevented by present-day engineered safety features and administrative controls. While tritium facility activities are expected to increase following approval of the proposed 30-g inventory limit, they will not approach the level existing in 1991 upon which the 1992 EIS/EIR was based. Further, as described above, the accident frequency prevailing in 1991 has, in fact, been substantially reduced.

An updated SAR (LLNL 1998c) and a new TSR document (LLNL 1998d) were approved in 1998, supporting the continued applicability of the 1992 EIS/EIR scenario for Building 331. The tritium accident scenario assessed in the SAR gave an MEI dose that was well within the bounds of the MEI dose assessed in the 1992 EIS/EIR. The TSR continues to limit tritium to the 3.5 g used in the scenario. Because there is no change in the MAR, the estimated accident scenario impact analyzed in the 1992 EIS/EIR for this building remains valid. The 1992 EIS/EIR calculated a CEDE of 0.026 rem at the nearest site boundary (400 m to the south) from a beyond-design-basis earthquake, primarily from internal exposure following inhalation of tritium vapor. This dose is significantly lower than the whole-body dose range (1 to 5 rem) at which the EPA recommends protective action for accidental releases (EPA 1992), and is less than the MEI 0.2-rem dose from the bounding tritium accident of a 5-g release from Building 298.

Tritium facility activities are expected to increase as the tritium administrative limits are increased to 30 g. However, they will not approach the activity level existing in 1991 on which the 1992 EIS/EIR was based. Normally, increased activities are associated with increased frequency of accidents. However, as already noted, improvements in facility systems and operations since 1992 have significantly reduced the expected frequency of accidents leading to tritium releases. These safety enhancements will ensure that the MAR assessed in 1992 will not increase, and, therefore, the increased inventory limits are not expected to result in any increase in risk from the accident scenario presented in the 1992 EIS/EIR.

6.2.3 Nondestructive Test Facility: Building 239

Components are brought into Building 239 for radiographic examination. These items are not stored in Building 239 but instead are returned to storage in Building 332 on a daily basis after radiography. All of the plutonium and uranium in the components is sealed in doubly contained packaging that is not removed during radiographic operations. One of the sealed barriers of the double-barrier packaging is always a hard (metal) material. Failure of the containment barriers is unlikely. However, it was assumed for this analysis that a seismic event or accidental dropping of the component could result in compromise of the containment barriers. This breach would expose the plutonium to the building atmosphere, allowing oxidation and release of some of the oxide. The current Building 239 SAR evaluates the consequences of this accident on the basis of an inventory of 4.5 kg of weapons-grade plutonium or 18.5 kg of uranium-235 (LLNL 1994c). The SAR analysis was scaled linearly to provide an estimate for this SA of the potential accident impacts if the administrative inventory limits were increased from 4.5 to 6 kg for plutonium and from 18.5 to 25 kg for uranium. Details of the methodology and assumptions for calculating the dose to an individual at the fenceline are given in the Building 239 SAR (LLNL 1994c).

For this SA evaluation, the potential radiation dose to an individual at the site boundary (366 m from the building) was estimated (by the scaling method) to be 0.017 rem for the increased 6-kg inventory limit for plutonium. For the increased 25-kg inventory limit for uranium, the estimated potential radiation dose to an individual at the site boundary (366 m) (based on the scaling method) was 2.1×10^{-9} rem. These projected doses are much lower than the whole-body dose range (1 to 5 rem) at which the EPA recommends protective action for accident releases (EPA 1992) and are well within the 1992 EIS/EIR bounding accident involving operations with plutonium or uranium at LLNL.

6.3 CONCLUSIONS

For a hypothetical uranium criticality event occurring in Building 332, the estimated MEI dose is 3.8 rem, as noted in Table 6.3. The proposed increased uranium administrative limit for Building 332 would not change the material at risk. The change in the criticality accident consequences assessed here compared with those assessed in the 1992 EIS/EIR is due to the introduction of the uranium criticality accident. Although the consequences (MEI dose and population dose) of the uranium criticality event are twice those of the plutonium criticality event, they are still less than those of the bounding americium-241 release due to the earthquake as given in the 1992 EIS/EIR. The frequency of the criticality accident is low, and the risk posed to the public remains very small.

The estimated impacts for Building 331 with an increased administrative limit and improved safety features remain the same or less than those identified in the 1992 EIS/EIR. The radiation doses to an individual for the proposed administrative limit of 6 kg for plutonium and 25 kg for uranium-235 in Building 239 were estimated to be 0.017 rem and 2.1×10^{-9} rem, respectively. The estimated dose to an individual at the nearest boundary for both of these facilities is still significantly lower than the whole-body dose range (1 to 5 rem) at which the EPA recommends protective action for accident releases (EPA 1992).

The calculated consequences to the exposed populations and to a maximally exposed individual from an accident involving radiological material have increased in some cases since publication of the 1992 EIS/EIR. However, the calculated impacts still are not significantly different from the envelope of consequences established by the 1992 EIS/EIR. Therefore, the accident analysis presented in the 1992 EIS/EIR still adequately characterizes the potential impacts of such accidents that may occur at LLNL.

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